The value of light in the treatment of disease was shown by Dr. Adrian Palm in 1890 when he drew attention to the value of sunlight in the treatment of rickets. In 1893 Dr. Finsen, in Copenhagen, first used the carbon arc lamp to supply the ultra-violet radiation deficient in the sunlight of that climate and which he considered necessary for the treatment of surgical tuberculosis and lupus. Heliotherapy, the use of natural sunlight, was begun by Dr. O. Barnard in the Alps, and a few years later Professor A. Rollier started his famous clinic at Leysin, in the Vaudois Alps, for the treatment of tuberculosis. [An account of his own work by Professor Rollier appears in The British Journal of Nursing for December, 1934.] The clear atmosphere of the Alps permits a greater amount of ultra-violet radiation to penetrate to the earth than is possible in this country. In England much work in natural sunlight and artificial ray-therapy has been done by Sir Henry Gauvain at Alton and Hayling Island. The first municipal solarium in this country was started in Bermondsey by Dr. King Brown, M.D., D.P.H., in 1924. Now practically every hospital and many general practitioners have their own light equipment.

Radiation and Light.

Scientists tell us that matter is composed of molecules which are made up of the atoms of the different elements in varying combinations. The atom of each element is characteristic of it both as regards weight and composition. Every atom is composed of a nucleus consisting of a proton and a greater or lesser number of electrons. The nucleus of the atom has a charge of positive electricity, and around it revolve a varying number of planetary electrons the negative charge of which is just sufficient to balance the positive charge of the nucleus. As a result of this the atom, in its normal state, is electrically neutral. The exception to this is the radio-active elements which are in a constant state of disintegration. When some disturbing influence attacks the atom in such a way that one or more of the planetary electrons move from their sphere there is a loss of energy from the atom. Should the electron become entirely separated from its parent atom the latter will have an excess of positive electricity and will tend to attract to itself a free electron, or it will combine with another atom to form a molecule by the force of chemical attraction. What we call radiation is the result of the electric disturbance within the atomic system: the nearer the disturbed electron is to the nucleus the greater is the radiation. All hot bodies and gases emit radiation which produces a greater or lesser degree of heat in the object upon which it falls. There is much controversy whether radiation is the actual streaming away of electrons from the atom, or whether it is simply vibrations set up in an all-pervading medium, the ether, by movements and disturbances within the atomic structure. The latter theory is the more familiar, although perhaps not the most recent, and, as we are in the habit of speaking of light waves and of the wave-lengths employed in wireless transmission, it is more convenient to think of light in this way.

Light Waves.

The length of a wave is the distance between the nearest corresponding points in the wave. These wave-lengths vary from the 1.4 A.U. of the gamma rays of radium to the much greater amplitude of the Hertzian waves used in wireless transmission, which are measured in metres and kilometres. The frequency of waves is the number of oscillations per second, or the rapidity with which one wave follows another. This is not to be confused with the velocity, or speed of propagation, which is constant for all types of radiation no matter what the wave-length may be. The velocity is always the same—namely, 186,326 miles per second. In their physical nature all types of radiation are the same, in spite of the different effects which they produce, and they have been divided arbitrarily into a scale of octaves according to their wave-lengths, each successive octave implying that the numerical value of the wave-length has been doubled. About the middle of the scale occur the group of waves which affect the eye in such a way as to produce the sensation we call light. These have wave-lengths varying from about 4,000 A.U. to 7,000 A.U. and they are grouped in the following order:—

Violet	...	4,000 to	4,500	A.U.
Indigo	...	4,500 ,,	5,000	,,
Blue	...	5,000 ,,	5,500	,,
Green	...	5,500 ,,	5,900	,,
Yellow	...	5,900 ,,	6,000	,,
Orange	...	6,000 ,,	6,400	,,
Red	...	6,400 ,,	7,700	,,

Immediately beyond the violet end of the spectrum of sunlight lie the near ultra-violet rays which extend from 4,000 A.U. to 2,900 A.U. Below 2,900 A.U. the atmosphere of this country cuts out any waves which might come from the sun. Of these waves which are of the greatest therapeutic value are those between 3,100 and 2,900 A.U.; they cause chemical or actinic changes in living tissue and act upon the body in various ways for the improvement of health. Rays below 2,900 A.U. can be produced easily by artificial means such as the mercury vapour lamp, the carbon arc lamp and the tungsten arc lamp. The rays between 2,900 and 1,850 A.U. are bactericidal in their effect. Of the rays between 1,850 A.U. and 14 A.U., which is the length of the longest X-rays, very little is known, although recently they have been produced by scientists. Radiation from radium produces waves of from 1.4 to .07 A.U., which are of very great value in the treatment of cancer. Quite recently it has been discovered that an infinitely smaller type of ray, known as the cosmic ray, reaches the earth from a source unknown to us. If we now transfer our thoughts from the ultra-violet spectrum to the infra-red we find a large group of rays which are thermal in their effect. Up to the present time only those infra-red rays which lie between 7,700 and 60,000 A.U. have been found to be of proved value in therapeutics. They have great penetrating power and are valuable on account of their analgesic properties.

This article deals with a very difficult subject, but for the better understanding of Ultra-violet and Infra-red therapy as well as the effects of natural sunlight some knowledge of the scientific aspect is helpful. We cannot know too much of any subject, and the more we learn of the wonders of Nature the more appreciative ought we to be of their value. An account of some of the methods employed in ray-therapy and their effects will be included in a later issue.

(To be concluded.)

previous page next page